Postemergence Broadleaf Herbicide Safety on Putting Greens

PURDUE UNIVERSITY
TURFGRASS SCIENCE

Aaron Patton and Dan Weisenberger, Department of Agronomy, Purdue University

SUMMARY: Few broadleaf weeds can survive on putting greens with the exception of white clover, mouse-ear chickweed, and prostrate spurge. Despite a golf course superintendent's best efforts and even with the use of sound management practices, weeds other than annual bluegrass do occasionally occur on putting greens. However, many golf course superintendents are hesitant to use herbicides on their putting greens for fear that injury might occur. The objective of this experiment was to determine the safety of postemergence broadleaf herbicides on greens height creeping bentgrass and *Poa annua*. Some injury was observed from treatments on both annual bluegrass and creeping bentgrass putting greens but injury levels were acceptable (≥ 7) for all treatments including when herbicides were applied at a 2X rate. There were no differences in turf quality among treatments on either the annual bluegrass putting green or the creeping bentgrass putting green. These results suggest that broadleaf herbicides labeled for putting green use can be safely applied in the fall without fear of causing unacceptable injury.

Few herbicides or plant growth regulators are needed on golf course putting greens to control weeds with the exception of annual bluegrass (*Poa annua*). This is due to the fact that few broadleaf weeds can survive these low mowing heights with the exception of white clover, mouse-ear chickweed, and prostrate spurge. Crabgrass and goosegrass are problematic grassy weeds that can also occur in putting greens, especially in southern Indiana and the transition zone. Despite a golf course superintendent's best efforts and even with the use of sound management practices, weeds other than annual bluegrass do occasionally occur on putting greens. However, many golf course superintendents are hesitant to use herbicides on their putting greens for fear that injury might occur. The objective of this experiment was to determine the safety of postemergence broadleaf herbicides on greens height creeping bentgrass and annual bluegrass..

ADDITIONAL INDEX WORDS:
2,4-D; 4-Speed; 4-Speed XT; Banvel; carfentrazone; dicamba; Mecomec 2.5; mecoprop (MCPP); pyraflufen-ethyl; Quicksilver T&O; triclopyr; Trimec Bentgrass; Trimec Classic; Trimec Encore; Trimec Southern.

Patton, A., and D. Weisenberger. 2012. Postemergence Broadleaf Herbicide Safety on Putting Greens. 2011 Annu. Rep. - Purdue Univ. Turfgrass Sci. Progr. p. 55-59.

MATERIALS AND METHODS

The experiment was conducted at the W.H. Daniel Turfgrass Research and Diagnostic Center in West Lafayette, IN. One site was 'Pennlinks' creeping bentgrass (*Agrostis stolonifera*) grown on a USGA specification sand putting green and a second site was predominately annual bluegrass grown on a native soil putting green. Experimental design was randomized complete block with three replications and an individual plot size of 25 ft^2. Plots were mown at 0.135 inches daily. Herbicides included in this study are summarized in Table 1 and they were applied at the putting green label rate and at a rate 2× the label rate. Plots were treated with herbicide 24 Oct. 2011. Herbicides were applied in 40 gpa water with a CO_2-pressurized sprayer at 30 psi. An untreated check was included for comparison. Injury to creeping bentgrass was rated on a 9 to 1 scale with 9 = no injury, 7 = acceptable injury, and 1 = completely brown turf. Turf quality was visually rated using a scale of 9 to 1 with 9 = best quality, 7 = acceptable quality, and 1 = totally brown and/or bare plot. When visible injury was present, digital

images were taken using a light box and then analyzed for color in SigmaScan Pro 5. A FieldScout CM 1000 Chlorophyll Meter was used when visible injury was present to gather three reading per plot and then averaged for analysis. All data were analyzed using SAS (SAS Institute, Inc). Means were separated using Fisher's protected least significant difference when F tests were significant at α=0.05.

Results and Discussion

Some injury was observed from treatments on both annual bluegrass and creeping bentgrass putting greens but injury levels were acceptable (≥ 7) for all treatments including when herbicides were applied at a 2X rate (Table 2). There were no differences in turf quality among treatments on either the annual bluegrass putting green or the creeping bentgrass putting green (Table 3). Results of turf color from digital image analysis were inconsistent with visual ratings (data not shown) likely due to the poor turf color on the plots as they entered winter dormancy. The CM1000 chlorophyll meter yielded results similar to visual ratings on the creeping bentgrass putting green with Banvel at 2 pt/A yielding the lowest mean chlorophyll index among plots on the annual bluegrass putting green (Table 4). These results suggest that broadleaf herbicides labeled for putting green use can be safely applied in the fall without fear of causing unacceptable injury. More injury might be expected from late spring and summer applications.

Table 2. Herbicide effect on injury to creeping *Poa annua* and creeping bentgrass.

		Injury					
Treatment	Rate	2 Nov	17 Nov	2 Dec	2 Nov	17 Nov	2 Dec
		Poa annua			creeping bentgrass		
4-Speed	1.8 pt/A [a]	9.0 a [b]	9	8 abc	9 a	9.0 a	9.0 a
4-Speed XT	1.8 pt/A [a]	9.0 a	9	9 ab	9 a	9.0 a	8.7 ab
Banvel	1 pt/A [a]	9.0 a	9	8 abc	9 a	8.7 b	8.3 bc
Mecomec 2.5	4 pt/A [a]	8.7 ab	9	9 a	8 b	9.0 a	8.7 ab
Quicksilver T&O + NIS	6.7 oz/A [a] 0.25% v/v	9.0 a	9	9 ab	9 a	9.0 a	9.0 a
Trimec Bentgrass	2.7 pt/A [a]	9.0 a	9	8 abc	9 a	9.0 a	8.7 ab
Trimec Classic	1.8 pt/A [a]	9.0 a	9	9 ab	9 a	9.0 a	9.0 a
Trimec Encore	1.8 pt/A [a]	9.0 a	9	9 ab	9 a	9.0 a	9.0 a
Trimec Southern	2 pt/A [a]	9.0 a	9	8 bcd	9 a	9.0 a	9.0 a
4-Speed	3.6 pt/A [c]	9.0 a	9	8 abc	9 a	9.0 a	8.3 bc
4-Speed XT	3.6 pt/A [c]	8.7 ab	8	7 d	9 a	9.0 a	8.3 bc
Banvel	2 pt/A [c]	9.0 a	9	8 cd	9 a	8.0 c	7.3 d
Mecomec 2.5	8 pt/A [c]	8.0 c	9	9 ab	9 a	9.0 a	9.0 a
Quicksilver T&O + NIS	13.4 oz/A [c] 0.25% v/v	8.3 bc	9	9 ab	9 a	9.0 a	9.0 a
Trimec Bentgrass	5.4 pt/A [c]	9.0 a	9	9 a	9 a	9.0 a	8.3 bc
Trimec Classic	3.6 pt/A [c]	9.0 a	9	9 a	9 a	9.0 a	8.3 bc
Trimec Encore	3.6 pt/A [c]	9.0 a	9	8 abc	9 a	9.0 a	8.0 c
Trimec Southern	4 pt/A [c]	8.6 ab	9	8 abc	9 a	9.0 a	8.0 c
Untreated		9.0 a	9	9 a	9 a	9.0 a	9.0 a
P-value		0.0007	NS	0.0111	0.0002	<0.0001	0.0001

[a] Label rate for putting green applications.
[b] Within columns, means followed by the same letter are similar.
[c] 2X putting green label rate.

Table 1. Broadleaf herbicides labeled for creeping bentgrass putting greens.

Trade Name (product/Acre)	Ingredients (amount of a.i. or a.e./A in parentheses)	Label rate/Acre	Label Language	Label Comments	Application Volume (gal/A)
4-Speed	2,4-D (0.5) + MCPP (0.13) + dicamba (0.05) + pyraflufen ethyl (0.001)	1.8 pint	Putting and Bowling Greens	Avoid applications during periods when turf is under stress due to high heat, humidity, and reduced moisture. Slight turf yellowing will disappear after about one week.	43 to 87
4-Speed XT	2,4-D (0.5) + triclopyr (0.06) + dicamba (0.06) + pyraflufen ethyl (0.001)	1.8 pint	Putting and Bowling Greens	Avoid applications during periods when turf is under stress due to high heat, humidity, and reduced moisture. Slight turf yellowing will disappear after about one week.	43 to 87
Banvel	dicamba (0.5)	1 pint	Bentgrass	Label neither allows nor restricts applications to putting greens. Use 1 pint or less of product per acre. Do not use on bentgrass unless possible crop injury can be tolerated. [Author note: weeds can be controlled with as little as 4 fl oz/acre with this herbicide]	3 to 50
Mecomec 2.5	mecoprop-p (MCPP) (1.25)	4 pint	Established Greens	Use only on actively growing turf that is not under stress. Do not apply to bentgrass in the heat of summer.	22 to 174
Quicksilver T&O	carfentrazone (0.1)	6.7 oz	Golf Course Greens	Quicksilver (carfentrazone) T&O 1.9EC at 2.0 to 6.7 oz per acre when temperatures are less than 85 °F provides excellent moss control. Apply as often as every two weeks to putting greens infested with silvery thread moss. Annual bluegrass can be damaged at rates greater than 2.0 oz Quicksilver T&O 1.9EC per acre. Use a non-ionic surfactant at 0.25% v/v. Do not apply to bentgrass when temperatures exceed 90 °F.	20 to 175
Trimec Bentgrass	mecoprop (0.24) + 2,4-D (0.15) + dicamba (0.06)	2.7 pint	Putting and Bowling Greens	Do not apply to bentgrass under stress. Do not apply when air temperatures exceed 85° F. May or fall application recommended.	high
Trimec Classic	2,4-D (0.45) + mecoprop (0.12) + Dicamba (0.05)	1.8 pint	Putting and Bowling Greens	Do not exceed 1.0 fl oz/1,000 ft^2 on creeping bentgrass putting greens using a spray volume of 5 gallons/1000 ft^2. Do not apply to bentgrass under stress. Do not apply when air temperatures exceed 85° F.	145
Trimec Encore	MCPA (0.67) + mecoprop (0.14) + dicamba (0.07)	1.8 pint	Putting and Bowling Greens	Do not exceed 1.0 fl oz/1,500 ft^2 on creeping bentgrass putting greens using a spray volume of 5 gallons/1000 ft^2. Do not apply to bentgrass under stress. Do not apply when air temperatures exceed 85° F. Slight yellowing will occur within a week.	145
Trimec Southern	mecoprop (0.33) + 2,4-D (0.36) + dicamba (0.07)	2.0 pint	Bentgrass	Use 2.0 pints of product per acre. Do not overdose closely-mowed bentgrass. Bermudagrass and bentgrass are moderately sensitive to 2,4-D.	2 to 300

Table 3. Herbicide effect on quality of *Poa annua* and creeping bentgrass.

		Quality	
Treatment	Rate	2 Nov	2 Nov
		Poa annua	creeping bentgrass
4-Speed	1.8 pt/A [a]	5.3	7.0
4-Speed XT	1.8 pt/A [a]	5.0	7.0
Banvel	1 pt/A [a]	5.7	7.0
Mecomec 2.5	4 pt/A [a]	5.0	6.7
Quicksilver T&O + NIS	6.7 oz/A [a] 0.25% v/v	5.0	7.0
Trimec Bentgrass	2.7 pt/A [a]	5.0	7.0
Trimec Classic	1.8 pt/A [a]	5.0	7.0
Trimec Encore	1.8 pt/A [a]	5.0	6.7
Trimec Southern	2 pt/A [a]	5.3	7.0
4-Speed	3.6 pt/A [b]	5.0	7.0
4-Speed XT	3.6 pt/A [b]	5.3	7.0
Banvel	2 pt/A [b]	5.0	7.0
Mecomec 2.5	8 pt/A [b]	5.0	7.0
Quicksilver T&O + NIS	13.4 oz/A [b] 0.25% v/v	5.0	7.0
Trimec Bentgrass	5.4 pt/A [b]	4.7	7.0
Trimec Classic	3.6 pt/A [b]	5.0	7.0
Trimec Encore	3.6 pt/A [b]	5.3	6.3
Trimec Southern	4 pt/A [b]	5.3	7.0
Untreated		5.0	7.0
P-value		NS	NS

[a] Label rate for putting green applications.
[b] 2X putting green label rate.

Table 4. Herbicide effect on chlorophyll meter readings for creeping *Poa annua* and creeping bentgrass.

		Chlorophyll meter readings					
Treatment	Rate	2 Nov	17 Nov	2 Dec	2 Nov	17 Nov	2 Dec
		Poa annua			creeping bentgrass		
4-Speed	1.8 pt/A [a]	159	175	161	200	210 abc [b]	177 cdefg
4-Speed XT	1.8 pt/A [a]	154	168	152	192	211 abc	184 abcde
Banvel	1 pt/A [a]	161	180	167	198	203 cd	182 abcdef
Mecomec 2.5	4 pt/A [a]	158	180	175	193	201 cd	176 cdefg
Quicksilver T&O + NIS	6.7 oz/A [a] 0.25% v/v	161	188	169	204	221 ab	194 a
Trimec Bentgrass	2.7 pt/A [a]	155	174	155	192	204 cd	179 cdefg
Trimec Classic	1.8 pt/A [a]	160	175	155	199	206 bcd	181 bcdef
Trimec Encore	1.8 pt/A [a]	165	176	164	189	196 cde	171 fg
Trimec Southern	2 pt/A [a]	165	177	160	198	207 bc	188 abc
4-Speed	3.6 pt/A [c]	159	176	166	185	184 e	171 efg
4-Speed XT	3.6 pt/A [c]	155	174	158	189	200 cde	178 cdefg
Banvel	2 pt/A [c]	157	170	155	190	189 de	167 g
Mecomec 2.5	8 pt/A [c]	150	168	155	192	201 cd	175 cdefg
Quicksilver T&O + NIS	13.4 oz/A [c] 0.25% v/v	162	181	170	201	227 a	184 abcd
Trimec Bentgrass	5.4 pt/A [c]	150	167	151	189	202 cd	176 cdefg
Trimec Classic	3.6 pt/A [c]	159	174	159	193	200 cde	173 defg
Trimec Encore	3.6 pt/A [c]	159	179	168	183	195 cde	170 fg
Trimec Southern	4 pt/A [c]	156	182	169	189	199 cde	171 efg
Untreated		163	187	173	202	221 ab	192 ab
P-value		NS	NS	NS	NS	0.0010	0.0029

[a] Label rate for putting green applications.
[b] Within columns, means followed by the same letter are similar.
[c] 2X putting green label rate.